Green Elephant Biotech GmbH

Product Carbon Footprint Report

Comparison of a multi-layer stack and the CellScrew® 10K

Version 1.1

Date: June 26, 2026

1 Introduction

This product carbon footprint was calculated using the Cradle-to-Customer plus End-of-Life approach. Emissions along the following life cycle phases were taken into account:

Extraction and pre-processing of raw materials and packaging, production, delivery of the product to the customer's door, and relevant disposal emissions of the product and packaging. In the "Cradle-to-Customer plus End-of-Life" approach, the focus of the calculation is on those processes that can be controlled by the producer. The emissions from the use phase are mostly not controllable and are subject to assumptions and estimates in the application and are therefore not been taken into account in the calculation. Where possible, primary data was used in the calculation. Where this was not possible, secondary data from recognized sources were used. The emission factors were taken from internationally recognized databases such as ecoinvent or GEMIS. The dataset for PLA raw material was used and the carbon footprint of the raw material was set to 0.03 kg CO_2 instead of 0.12 kg CO_2 to consider the carbon accumulation during plant growth, which was not already factored in.
This is applicable since 100% of the carbon in the biopolymer originates from renewable agricultural resources instead of oil. 3rd party certification based on ASTM6866 is provided in Europe by Vinçotte and in the US by the USDA's BioPreferred program. All relevant greenhouse gases were considered, but CO_2 equivalents (CO2e) were used for better comparability. Emissions that cannot be directly attributed to the product, but are necessary for the production, such as employee travel or business trips were also included in the calculation.

For the CellScrew® (CS) 10K, data input was based on inhouse measurements. For the generic multi-layer stack, available data, inhouse measurements and databases were used as data input. The data represent the average of the most common multi-layer stacks by various brands and were normalized to a cell culture surface of 10,000 cm^2.

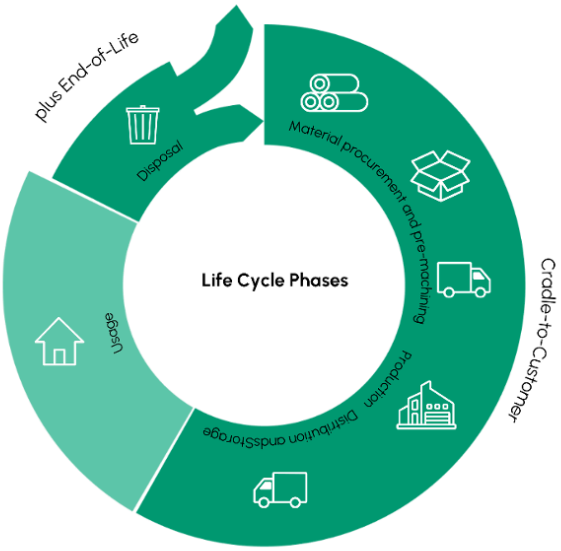

Figure 1: Life cycle phases of a cell culture flask.

2 Results

The following data and graphics summarize the results of the LCA analysis, comparing a generic multi-layer stack, made from polystyrene (PS), and the CS10K, made from plant-based polylactic acid (PLA).

Table 1: Cradle-to-grave carbon footprint of multi-layer stack (PS) and CellScrew® 10K (PLA) cell culture vessels, stratified by life cycle stage and emission source. Values expressed as absolute emissions (kg CO_2e) and relative contribution (%) to total product carbon footprint.

Source of emission (total) Source of emission (detail)	**Multi-layer stack (PS)**		**CellScrew® 10K (PLA)**	
	kg CO_2e	%	kg CO_2e	%
Material procurement and pre-machining	**23.91**	**62.40**	**3.41**	**62.00**
• Raw material	21.84	59.99	1.86	33.82
• Packaging	1.18	3.08	0.32	5.82
• Inbound logistics	0.89	2.32	1.24	22.55
Production	**0.92**	**2.40**	**0.19**	**3.45**
• Electricity	0.92	2.40	0.19	3.45
Distribution and storage	**0.73**	**1.91**	**0.73**	**13.27**
• Outgoing logistics	0.73	1.91	0.73	13.27
Disposal	**12.74**	**33.25**	**1.16**	**21.09**
• Incineration	12.74	33.25	1.16	21.09
Not imputable processes	**0.02**	**0.05**	**0.01**	**0.18**
• Common emissions	0.02	0.05	0.01	0.18
Total Result	**38.32**	**100**	**5.50**	**100**

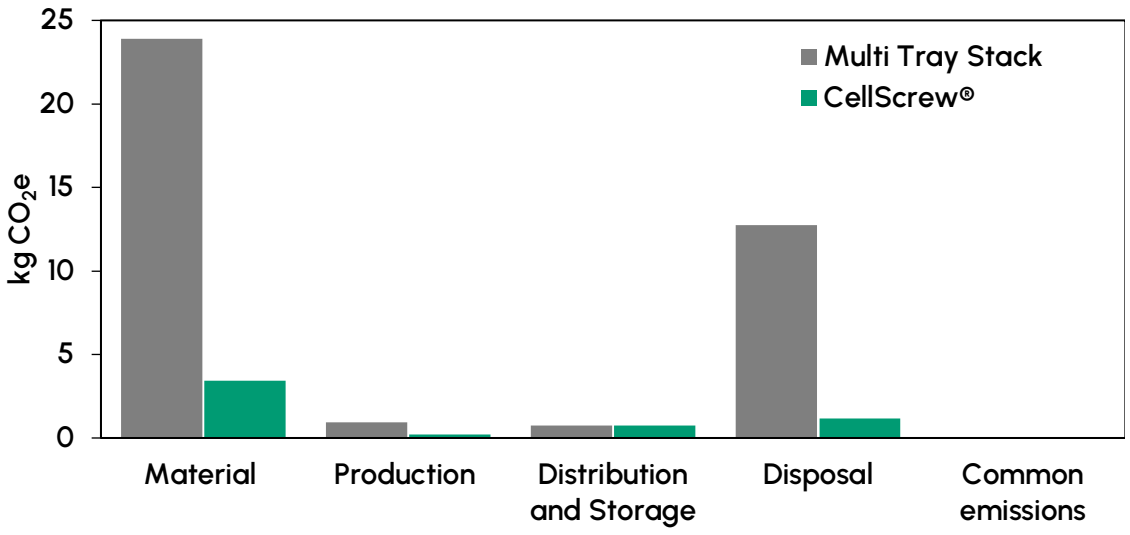

Figure 2: Comparison of the total carbon dioxide emissions for both cell culture systems. Common emission not visible at this scale (<0.1% of total).